

1.2. History of Lean

(continued)

From 1980-2000, universities and companies researched and developed many variations of the TPS to meet their own educational or business needs. This era is known as the “Lean Institute” phase and focused on implementing the TPS philosophies, tools, and methods in manufacturing industries. Companies quickly realized that these lean principles did not only apply to manufacturing, and from the year 2000 to today the “Lean Enterprise” era was established.

Today, industries such as banking, telecommunications, manufacturing, and energy implement lean tools and philosophies to foster continuous improvement and innovation, becoming industry leaders within their business sector.

1.3. Misconceptions about Lean Implementation

One of the most common misconceptions and misapplications of lean is thinking that lean means simply getting rid of process steps, process time, or process labor. Lean should never eliminate needed steps in a process. Remember that lean reduces waste and adds value. Setting arbitrary goals to reduce process cycle time or process costs by a certain rate, without understanding the value dynamics of your process, can lead to the elimination of truly value added steps. Instead, we need to first comprehensively define what is waste and what is value so that we can focus on reducing the waste in the process rather than the core of what we do well, i.e. the product and process value itself.

Lean may also be inappropriately described as a tool for manufacturing processes only. While it is true that lean has its roots in manufacturing, the principles of lean apply to all processes and all industries. Lean concepts and tools can be applied to all stages of wind generation, from construction to operations, from reducing crew travel and transportation of equipment during the construction of wind turbine to ensuring that time spent searching for tools during turbine maintenance is reduced by standardization and kitting of techniques. In addition, reducing motion also eliminates the opportunity for injuries. Implementation of a strong safety culture will also promote a positive lean culture.

1.4. Theory of Lean and Six Sigma

In any process that is consistently done over time, we can utilize Six Sigma to understand the amount of process variation a particular process is experiencing. The amount of process variation from a specific target is known as process variability. Identifying this variability identifies sigma values (how close are we to the target). Six Sigma is the most ideal process capability metric. Achieving a Six Sigma level process means the process achieves the desired target 99.99999% of the time. On the other hand, lean focuses on the individual steps within the process and ensures machine reliability and efficiency over time. Thus, the two complement one another and together are “Lean Six Sigma”.

In any process, we will find examples of the eight types of waste:

- **Transport:** movement of people, product, and information
- **Inventory:** storage of spare parts, work in progress, finished goods, or supplies
- **Motion:** reaching, lifting, bending, or other movements
- **Waiting:** for approvals, parts, equipment, or people
- **Over Production:** producing more than is needed or before it is needed
- **Over Processing:** doing more work than is necessary, producing tighter tolerances or grade than is necessary
- **Defects:** rework, scrap, all inspection activities
- **Talent:** under-utilizing people, the wrong person in the wrong job, lack of training or tools

An important concept in lean thinking is that of Kaizen. Kaizen is a practice of continuous improvement made by small, frequent changes for the better. Traditional process improvement thinking often focuses on large step-wise improvements and trying to achieve the “perfect” process before implementing a change. Kaizen looks for small changes that can be made every day, by everyone in the process, to ultimately drive a much larger cumulative improvement outcome.

Kaizen practices can be formalized within an organization or process with simple practices such as a daily improvement board or stand up improvement meeting. At the beginning of each shift, team members can gather for several minutes at the improvement board and each team member writes down one way they will improve their work during the coming day or one way in which they improved the process in their last workday.

2. Typical Lean Concepts

Before we venture into specific lean concepts, it must be communicated that these tools are used to solve specific business problems. For example, you would never use a hammer to unscrew a nut, and lean tools are no different. You would not use value stream mapping to determine the root cause of a particular failure in a gearbox. These tools are simple to use when you know where and when to apply them.

2.1. Value Stream Mapping: Identifying Process Gaps

Value stream mapping is a lean method used to analyze the current state of function in a value chain and design an optimized future state. A value chain is any process or series of physical events that delivers a product or service to a customer. Value stream mapping seeks to identify each task that discretely adds value to the overall process, displaying the measured time, labor, information, and material inputs and outputs of each task. The value stream map is based on the concept of one-piece-flow, or following a single 'component' through a series of value added steps. Knowing and documenting the current state of a process is the first step in working toward an ideal future state. Understanding the concept of 'flow' is also important to the value stream concept, as it seeks to optimize the efficiency of the overall process not the individual efficiencies of every resource involved. This allows the user to visualize where delays and waste may occur in the broader process, even when each sub-task may appear to be optimized.

To create a value stream map, representatives from each functional area in the process should participate. The engagement of the team is key both to ensuring the greatest accuracy and to facilitating conversations that may not occur in the day to day working environment. Not all participants will be able to envision an optimized future state. However, they may be able to identify smaller opportunities to improve flow. It's desirable for the team to walk and observe first hand the physical process taking place, including measurement of inventory, cycle time, changeover time (duration between locations or events), resources required (number of operators and equipment), utilization of resources, rework or quality metrics, and available working time. Once the current state is measured and an optimized future state is envisioned, the gap between current and future state should be analyzed and an action plan developed to close the gap. Value stream mapping has been known to identify up to 99% of the non-value adding activities embedded in the current state. If done right, this lean method will result in tangible improvement steps that can be prioritized based on return on investment.